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When You Can't STOP It!

By NORMAN LINVILLE

"It's a misfortune when you can't start your car, but it's a calamity when you can't stop it!"

That's one way of saying that the braking system of a car is perhaps the car's most important part. Do you know that approximately six times as much energy is required to stop a car from any given speed as is required to attain that speed—because the car is stopped in about one-sixth the time? That fact alone will give a very definite idea of the tremendous force exerted by the braking system on your car.

One of the car owner's primary duties to the public is to keep his car in good operating condition. And due to the combination of factory-trained mechanics and the up-to-date machines available in our modern garages this duty is very easy to carry out. The dynamic brake tester is one of these recently developed machines.

The principle involved in this machine is that of measuring the total braking force of the car on the machine and then determining its stopping distance from a graph which has braking force plotted against stopping distance, taken at a speed of twenty miles per hour. The easiest way to understand the operation of this tester is to see it in operation. Suppose we take your car in to have the brakes tested. This test is made free of charge; you are under no obligation to the garage even if your brakes are faulty. Undoubtedly, though, you will want to have any bad conditions corrected.

The tester is composed of four sets of motor-driven

rollers, or tester units, mounted on a steel frame which looks like a low greasing rack. The two tester units for the front wheels are set on tracks, and are automatically adjustable to any wheelbase from one hundred to one hundred sixty inches. The rear units are stationary.

The tester unit itself is made up of two corrugated cast iron rollers two feet wide and about five inches in diameter driven by a half-horsepower electric motor. These rollers measure the amount of braking force of each wheel independently of each other, and record that force on the dial shown in detail in the illustration. The mechanic then determines the condition of the brake from the dial reading. The only trick to the entire proceeding is to be able to read and *understand* these dial readings.

Now, here we are at the garage. That machine over there is the tester, and here's Jimmy, the mechanic. He'll demonstrate the tester by testing the brakes on your car.

The car is driven onto the tester under its own power, and from that point on the tester does all the work. The rattle and noise resulting from driving the car onto the tester are caused by the car bouncing over the rear tester units. The front wheels push the front tester units ahead until the rear wheels settle into place on the rear units, placing the front units at exactly the right position for that particular car. Then they are locked in place by means of a little hand wheel on the side. A chain from the

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front of the tester to the front axle holds the car in place.

The tester is all ready to start now. Here's where the fun begins—watch the dials. Even with the brakes fully released the dials register some pressure, which is due to bearing friction and grease resistance. The rear wheels will naturally register a heavier pressure than the front ones because they are turning the whole rear axle and drive-shaft. This "drag pressure" varies with the weight of the car;—the average 2,500-lb. car will have a drag of about twenty pounds for the front wheels and thirty for the rear. Any pressure noticeably greater than this normal drag shows that something is wrong: the wheel bearing or brakes may be too tight, the tires may be soft, the wheels may be misaligned, or the car may be improperly placed on the tester so that the wheels rub against the side of the tester units. A brief examination soon shows which of these troubles exists.

If one of the needles should move up to a fairly high pressure and back with each wheel revolution it would show that the drum is "out-of-round," and that the lining rubs the drum at the high spot. In service that wheel would lock sooner than the others and so skid the car. The only correction for such a condition is either to grind the drum into a perfectly round shape or to install a new drum.

So far the tester has been running free—the brakes have been fully released. Now the brake pedal is going about one-third of the way down. At that point, if the brakes are tight enough the dials should register around three hundred pounds pressure, but they show just a little over two hundred. These back wheels aren't in very good con-

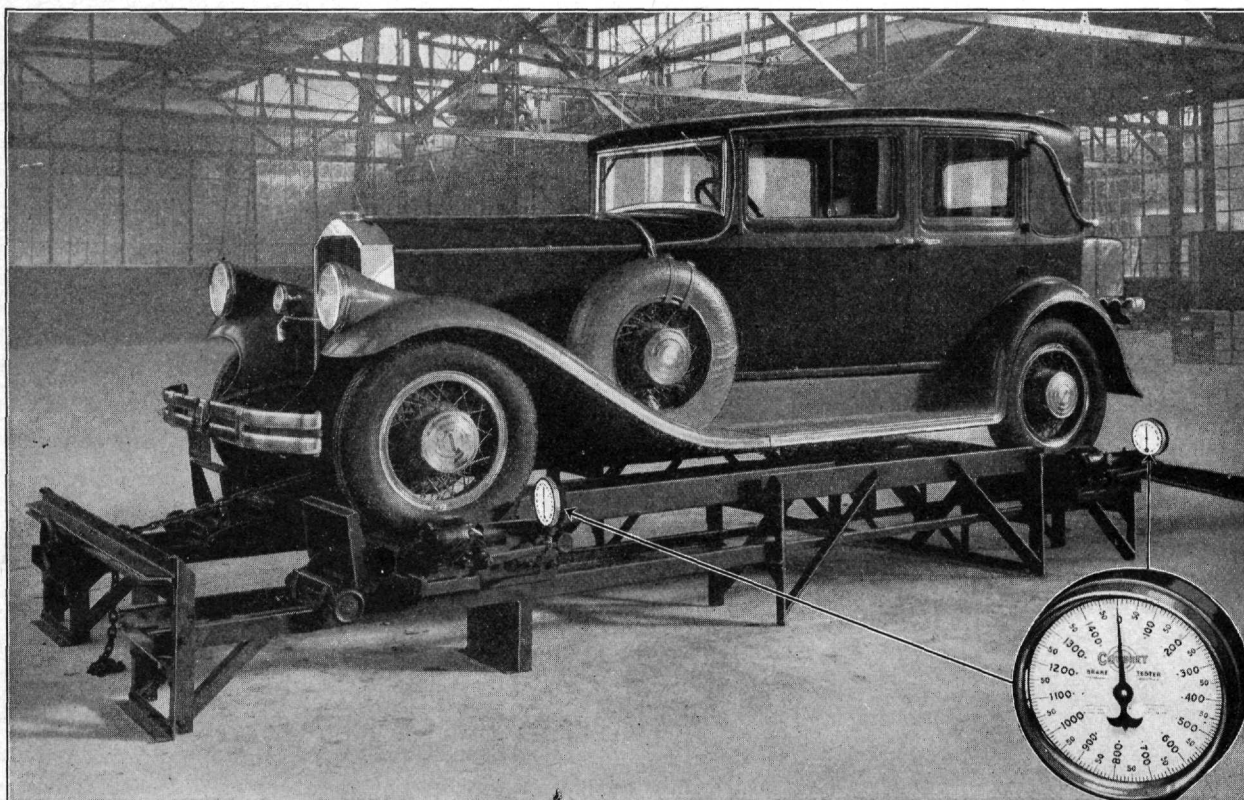
dition, either. This one is nearly seventy-five pounds lighter than the other. If you'd apply the brakes suddenly that one would lock; this one wouldn't, and the car would skid. All four needles show a steady pressure, though. The drums aren't "out-of-round."

The pedal's going all the way down now. Each dial shows exactly what that one brake is doing. The front wheels are still equal, and heavier than the rear ones, just as they should be. But these rear ones are acting up. You see, they haven't increased pressure very much over the first reading. Usually when dial pressure doesn't increase with pedal pressure the reason is that grease has leaked out of the wheel bearings or differential and has soaked the lining. And this film of grease on the inside of the wheel shows that that's probably the trouble here. You're lucky, though. This car uses a hard moulded lining, which can be cleaned free of grease with gasoline. If it were a woven lining it couldn't be cleaned; both rear wheels would have to be relined.

You want to have this trouble cared for, don't you? Of course, it's the only safe thing to do. Then, while Jimmy's doing the work I'll tell you some more about common brake troubles.

Chattering brakes may be caused by several conditions, among which are wet, glazed, or burned lining, rusty or unlubricated control parts, or weak or broken brake springs. If the lining is wet it should be dried out and brake shields should be installed to keep any moisture out from that time on. If it is burned or glazed new lining must be put in. Rusty or dry parts must be oiled, and weak or broken springs must be replaced with new ones.

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An Auto in Position on the Tester Frame, Ready for Brake Test and Adjustment

—Courtesy Bendia-Cowdrey

Loose axle or wheel connections are usually responsible for brakes that "grab." Sometimes, however, improperly adjusted lining will grab, and wet lining may do the same thing. A grabbing brake is shown on the tester by the needle suddenly jumping to a high pressure the instant the pedal is depressed. A thorough tightening of loose parts will nearly always correct the trouble if it is caused by such a condition. Correct lining installation and proper adjustment will take care of the improper adjustment fault. Drying wet lining and installing brake shields will overcome the trouble caused by wet lining.

Brakes that squeal are very annoying, both to the driver and to the general public. Most frequently the squeal is the result of improper adjustment or loose lining connections. Often the rivets have come in contact with the drum directly, and scored it. A squealing brake is self-evident on the tester. Adjustment or re-riveting should correct the first condition; grinding the drum smooth or installing a new one is the only remedy for a scored drum. Scored drums, by the way, not only squeal unbearably but also decrease the efficiency of the brake by several hundred per cent, since the lining can't possibly provide a smooth braking surface.

Hot brakes are also a result of improper adjustment. The brake has been tightened too much, so that when it is supposed to be disengaged it rubs the drum. The constant friction thus generates enough heat to burn the lining. Besides creating an unpleasant odor the burnt lining is of little use as a braking agent. Loosening the lining will usually fix a brake that overheats consistently. An excessive drag reading on the tester is the most common sign of a too-tight adjustment.

Very probably at some time or other you've driven a car that swerved to one side when the brakes were applied. It did so because one side of the car had more braking force than the other, and quite naturally the car tried to turn in the direction of most resistance. If each side of the car had an equal amount of retarding force it would stop without turning to one side. And since a tester of

this type can measure *accurately*, within *two pounds*, the braking force of each wheel the braking system can be perfectly equalized.

From the number of common brake faults which result from improper adjustment the fact that proper adjustment plays an extremely important part in good brake performance is obvious. It was for that reason that such a tester as this one was developed.

Jimmy has finished cleaning out your brakes, now, and he's ready to give them a final adjustment. You'll be able to see just how efficient this tester is. Perhaps you noticed him tapping the drums with his wrench a few minutes ago.

He adjusted the brakes roughly while the car was off the tester by tightening the lining until it just touched the drum and then backing it off slightly. He could tell when it touched the drum by tapping the drum with the wrench. If the lining did touch, the drum gave out a muffled sound; if it didn't, the sound was a clear, ringing tone. He'll adjust each brake to its exact maximum position in relation to the other three by keeping the tester going as he adjusts, and observing the dial readings as the adjustment progresses.

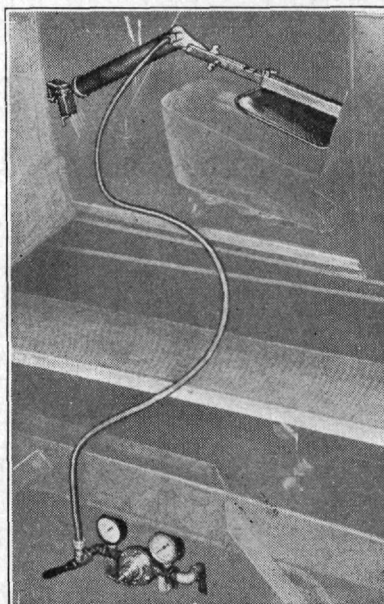
He uses this little pedal pusher to keep the brake pedal just where he wants it. The piston is operated by compressed air; by admitting the necessary amount of air, any desired pedal pressure can easily be obtained.

These brakes of yours are getting closer and closer to perfect every minute, now. The front ones are already equal, and tight enough. The rear ones are nearly so. You can see that the two dial needles get nearer to the correct pressure with each twist of the adjusting wrench. There! That last turn did the trick! These two wheels are within several pounds of each other now, and are balanced so that the front wheels exert about 65% of the braking force. On some cars a 50-50 adjustment is best; and the older ones operate most efficiently with only 40% in front. However, the new cars are being designed so that the front wheels carry most of the brake load.

When the car is run off the tester the front wheels pull the front tester units back into place for the next car. With such an arrangement, front-wheel drive cars must be backed onto the tester. Of course such a procedure is necessary because the car must be *pushed* on, not *pulled* on. The front units may be set manually and locked in place before the car is run on, but it's much easier simply to back that type of car on.

Your car is all ready to go, now. A road test is unnecessary when the brakes have been set up on this tester. Road conditions are duplicated exactly, as the rollers are designed to have the same friction co-efficient as a smooth, dry, level, concrete road.

You'll agree that this system of testing brakes mechanically is a vast improvement over the old methods. And isn't it reasonable to assume that, with such facilities available, there is very little excuse for driving a car with poor brakes?



The
Compressed
Air
Pedal
Pusher

—Courtesy Bendia-Cowdrey